CLAIMS

1. A method for calculating an absolute time difference in a radio system, comprising:

maintaining location measurement units having a known location in the radio system and location measurement areas specified thereby, the location measurement units receiving signals from base transceiver stations in their location measurement area, one base transceiver station in the location measurement area being a location measurement unit reference base transceiver station, and at least one measured base transceiver station in the location measurement area being common to a second location measurement area;

specifying a reference time for the reference base transceiver station and the detected time differences of the base transceiver stations in the location measurement area relative to the reference base transceiver station;

reporting the reference time of the reference base transceiver station of the location measurement area and the detected time differences of the other base transceiver stations in the location measurement area for updating a base transceiver station absolute time difference table maintained in the radio system;

calculating a computational absolute time for the reference base transceiver station by using the absolute time difference in the absolute time difference table of at least one reported base transceiver station, the difference being affected by the report of another location measurement unit, and the detected time difference reported by the location measurement unit to this base transceiver station;

calculating a corrected absolute time for the reference base transceiver station by using the computational absolute time specified for it, the reported reference base transceiver station reference time and a correction coefficient; and

using the corrected absolute time of the reference base transceiver station and the detected time differences of the reported base transceiver stations for calculating the absolute time differences for the base transceiver stations, and storing the computational absolute time differences of the base transceiver stations in the absolute time difference table.

2. The method of claim 1, wherein information of known geometric time differences of the base transceiver stations is maintained in the serving

mobile location center.

3. The method of claim 1, wherein the computational absolute time of the reference base transceiver station is calculated by subtracting the observed time difference reported to the base transceiver station from each absolute time difference of a reported base transceiver station found in the absolute time difference table and by adding the geometric time difference of the base transceiver station thereto, and by calculating the average of these clauses.

4. The method of claim 1, wherein the absolute time differences of the base transceiver stations to be stored in the absolute time difference table are calculated by adding the observed time difference of the base transceiver station to the corrected absolute time and by subtracting the geometric time difference of the base transceiver station from it.

5. The method of claim 1, wherein a table of real time differences calculated on the basis of the observed time differences and the geometric time differences used in the calculation of the base transceiver stations are maintained in the serving mobile location center.

6. The method of claim 1, wherein the real time differences calculated on the basis of the observed time differences and the geometric time differences are used in the calculation of the computational absolute time of the reference base transceiver station and the absolute time differences of the base transceiver stations.

7. The method of claim 1, wherein the correction coefficient is selected such that the relative error between the absolute time differences calculated on the basis of the reports of the different location measurement areas is as small as possible.

8. The method of claim 1, wherein the correction coefficient is selected such that the absolute time difference table follows the changes in the timing in accordance with every the report of every new location measurement area.

9. The method of claim 1, wherein the computational absolute time of the reference base transceiver station is calculated by using at least one base transceiver station common to the different location measurement areas.

10. The method of claim 1, wherein base transceiver stations belonging to networks of different operators and having known coordinates are usable in the calculation.

11. The method of claim 1, wherein the error caused by the height

of the measurement antenna used by the location measurement unit is pre-corrected to the absolute time difference of a base transceiver station stored in the absolute time difference table.

12. The method of claim 1, wherein the error caused by the cable error of the antenna used by the location measurement unit is pre-corrected to the absolute time difference of a base transceiver station stored in the absolute time difference table.

13. The method of claim 1, wherein the error caused by known reflection delays is pre-corrected to the absolute time difference of a base transceiver station stored in the absolute time difference table.

14. The method of claim 1, wherein the errors caused by the height of the measurement antenna or by the cable error of the antenna or by known reflection delays are corrected in connection with the absolute time difference calculation.

15. The method of claim 1, wherein the errors caused by the height of the measurement antenna or by the cable error of the antenna or by known reflection delays are corrected in connection with the measurements.

16. A radio system comprising:

at least one subscriber terminal to be located, and

at least three base transceiver stations used in the locationing and having a known location, one of the base transceiver stations operating as the base transceiver station serving the subscriber terminal;

wherein the radio system also comprises:

at least two location measurement units having a known location and location measurement areas specified by them, the location measurement units receiving signals from base transceiver stations in their location measurement area, one base transceiver station in the location measurement area being a reference base transceiver station of the location measurement unit, and at least one measured base transceiver station being common to a second location measurement area;

means for calculating an absolute time difference in the radio system locationing method,

a location service absolute time difference table for storing and maintaining absolute time difference values of base transceiver stations;

means for specifying a reference base transceiver station reference time;

means for specifying detected time differences of the base transceiver stations in the location measurement area relative to the reference base transceiver station;

means for maintaining values of the absolute time difference table of the base transceiver stations of the radio system;

means for reporting the reference time of the reference base transceiver station of the location measurement unit and the detected time differences of the other base transceiver stations in the location measurement area for updating the base transceiver station absolute time difference table maintained in the radio system;

means for calculating a computational absolute time for the reference base transceiver station by using the absolute time difference in the absolute time difference table of at least one reported base transceiver station, the difference being affected by the report of another location measurement unit, and the detected time difference reported by the location measurement unit to this base transceiver station;

means for calculating a corrected absolute time for the reference base transceiver station by using the computational absolute time specified for it, the reported reference base transceiver station reference time and a correction coefficient; and

means for using the corrected absolute time of the reference base transceiver station and the detected time differences of the reported base transceiver stations for calculating the absolute time differences for the base transceiver stations, and means for storing the computational absolute time differences of the base transceiver stations in the absolute time difference table.

17. The radio system of claim 16, wherein the serving mobile location center comprises means for maintaining data about the known geometric time differences of the base transceiver stations.

18. The radio system of claim 16, wherein the radio system comprises means for calculating the computational absolute time of the reference base transceiver station by subtracting the observed time difference reported to the base transceiver station from each absolute time difference of a reported base transceiver station found in the absolute time difference table and by adding the geometric time difference of the base transceiver station thereto, and by calculating the average of these clauses.

19. The radio system of claim 16, wherein the radio system comprises means for calculating the absolute time differences of the base transceiver stations to be stored in the absolute time difference table by adding the observed time difference of the base transceiver station to the corrected absolute time and by subtracting the geometric time difference of the base transceiver station from it.

20. The radio system of claim 16, wherein serving mobile location center comprises means for maintaining a table of real time differences calculated on the basis of the observed time differences and the geometric time differences.

21. The radio system of claim 16, wherein the radio system comprises means for using the real time differences calculated on the basis of the observed time differences and the geometric time differences in the calculation of the computational absolute time of the reference base transceiver station and the absolute time differences of the base transceiver stations.

22. The radio system of claim 16, wherein the radio system comprises means for selecting the correction coefficient such that the relative error between the absolute time differences calculated on the basis of the reports of the different location measurement areas is as small as possible.

23. The radio system of claim 16, wherein the radio system comprises means for selecting the correction coefficient such that the absolute time difference table follows the changes in the timing in accordance with every the report of every new location measurement area.

24. The radio system of claim 16, wherein the average absolute time of the reference base transceiver station is calculated by using at least one base transceiver station common to the different location measurement areas.

25. The radio system of claim 16, wherein base transceiver stations belonging to networks of different operators and having known coordinates are usable in the calculation.

26. The radio system of claim 16, wherein the radio system comprises means for pre-correcting the error caused by the height of the measurement antenna used by the location measurement unit in the absolute time difference of a base transceiver station stored in the absolute time difference table.

27. The radio system of claim 16, wherein the radio system com-

prises means for pre-correcting the error caused by the cable error of the antenna used by the location measurement unit in the absolute time difference of a base transceiver station stored in the absolute time difference table.

28. The radio system of claim 16, wherein the radio system comprises means for pre-correcting the error caused by known reflection delays in the absolute time difference of a base transceiver station stored in the absolute time difference table.

29. The radio system of claim 16, wherein the radio system comprises means for correcting, in connection with the absolute time difference calculation, the errors caused by the height of the measurement antenna or by the cable error of the antenna or by known reflection delays.

30. The radio system of claim 16, wherein the radio system comprises means for correcting, in connection with the measurements, the errors caused by the height of the measurement antenna or by the cable error of the antenna or by known reflection delays.